Fisheries Monitoring Related to Gravel Supplementation, Clear Creek, CA

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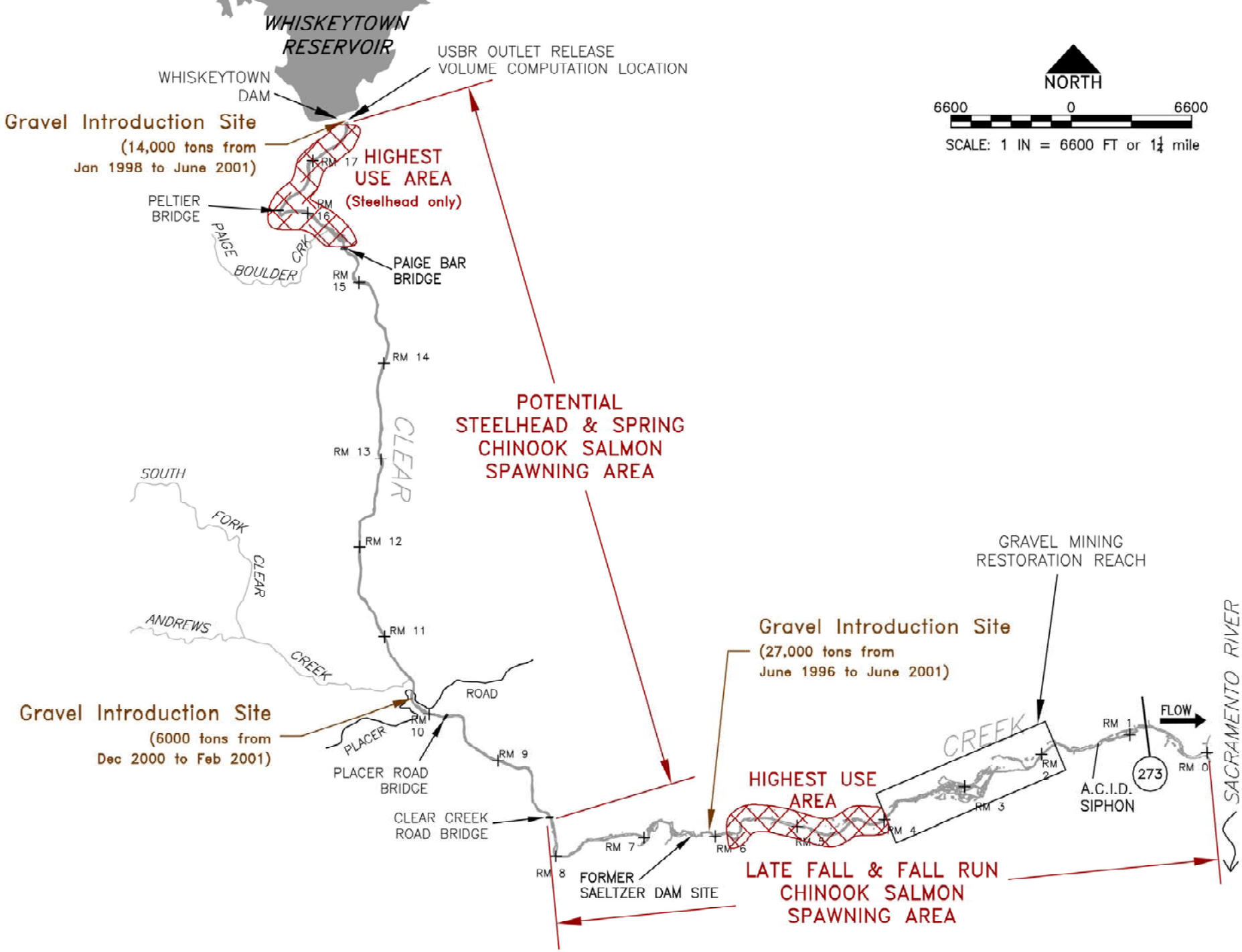
WARNING


ELEVATION
1214
1213


WHISKEYTOWN RESERVOIR
USBR OUTLET RELEASE VOLUME COMPUTATION LOCATION
WHISKEYTOWN DAM
NORTH
6600 0 6600
SCALE: 1 IN = 6600 FT or 1¼ mile
Gravel Introduction Site
(14,000 tons from Jan 1998 to June 2001)
RM 17
HIGHEST USE AREA
(Steelhead only)
PELTIER BRIDGE
RM 16
PAIGE BOULDER CRK
PAIGE BAR BRIDGE
RM 15
RM 14
POTENTIAL STEELHEAD & SPRING CHINOOK SALMON SPAWNING AREA
RM 13
CLEAR
SOUTH FORK CLEAR
RM 12
ANDREWS CREEK
RM 11
ROAD
Gravel Introduction Site
(6000 tons from Dec 2000 to Feb 2001)
PLACER
RM 10
PLACER ROAD BRIDGE
RM 9
Gravel Introduction Site
(27,000 tons from June 1996 to June 2001)
GRAVEL MINING RESTORATION REACH
CLEAR CREEK ROAD BRIDGE
RM 8
RM 7
RM 6
FORMER SAELTZER DAM SITE
HIGHEST USE AREA
RM 5
RM 4
CREEK
RM 3
RM 2
RM 1
FLOW
A.C.I.D. SIPHON
273
RM 0
SACRAMENTO RIVER
LATE FALL & FALL RUN CHINOOK SALMON SPAWNING AREA

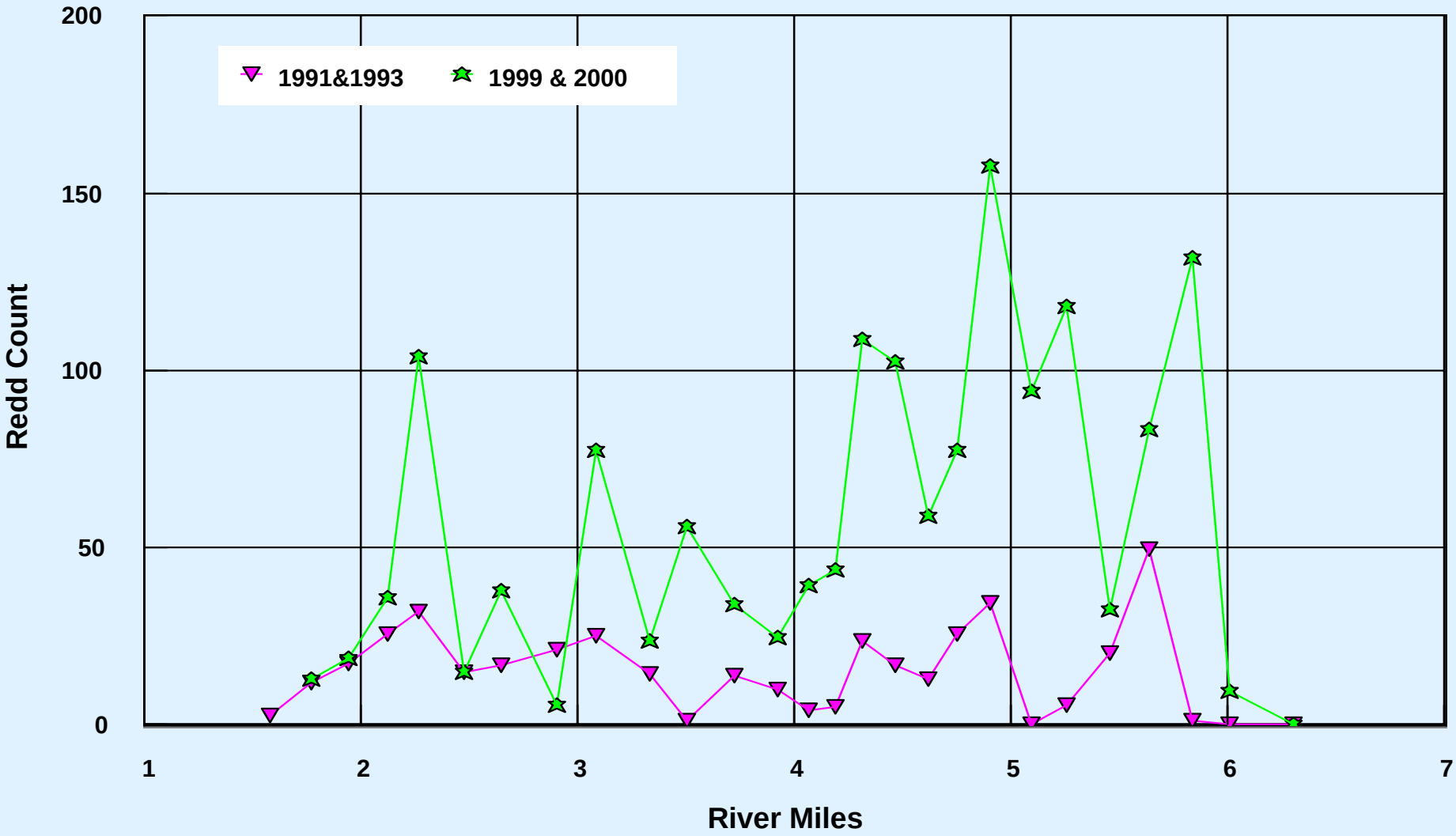
Today's Discussion Areas

- Lower alluvial reaches- Fall Chinook
  - Gravel injections created new spawning areas
  - Saeltzer Dam removal
  - Gravel placement projects
- Upper canyon reaches- spring run / steelhead
  - Experimental gravel distribution pulse flow

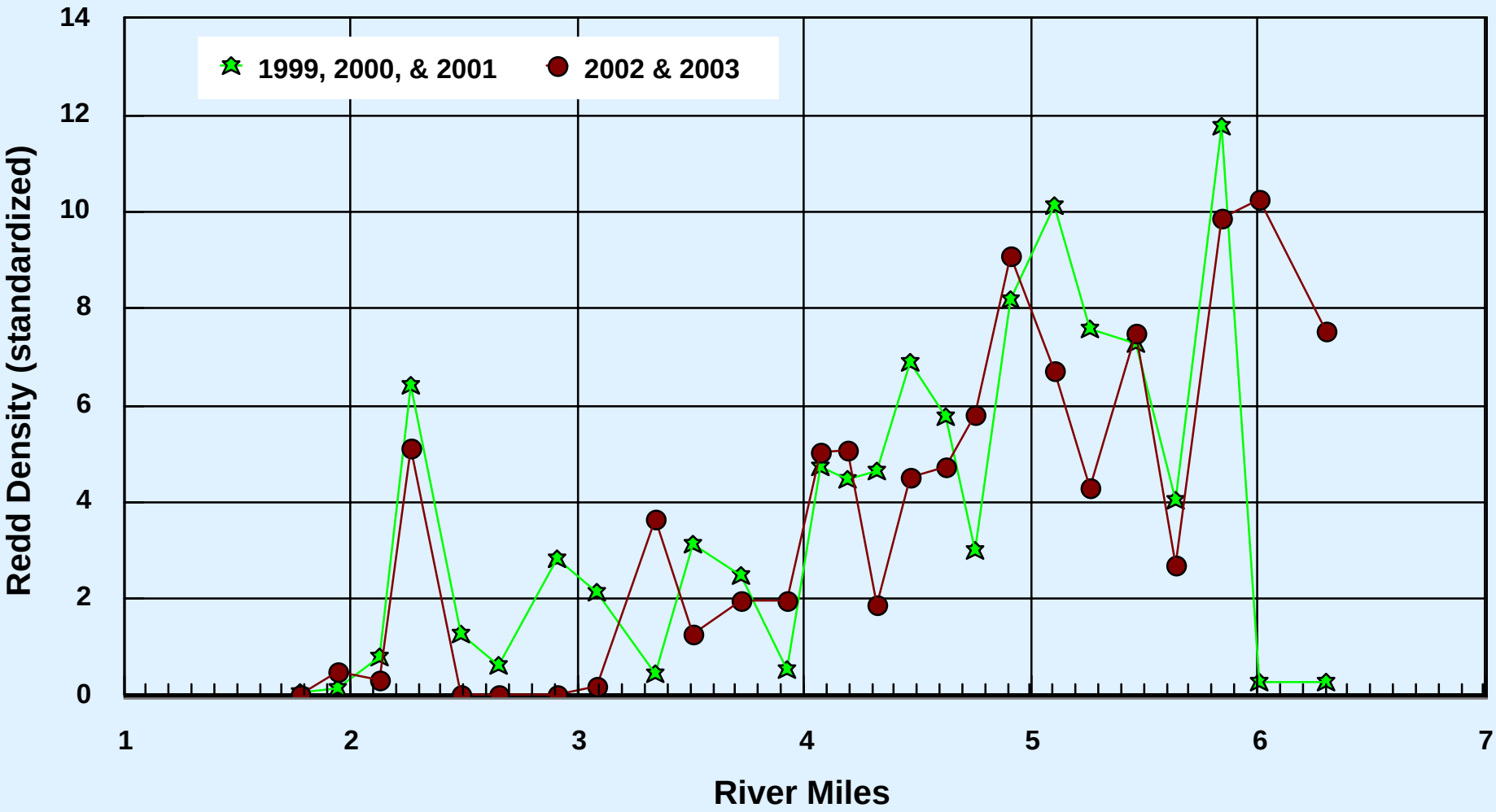
Fisheries Monitoring

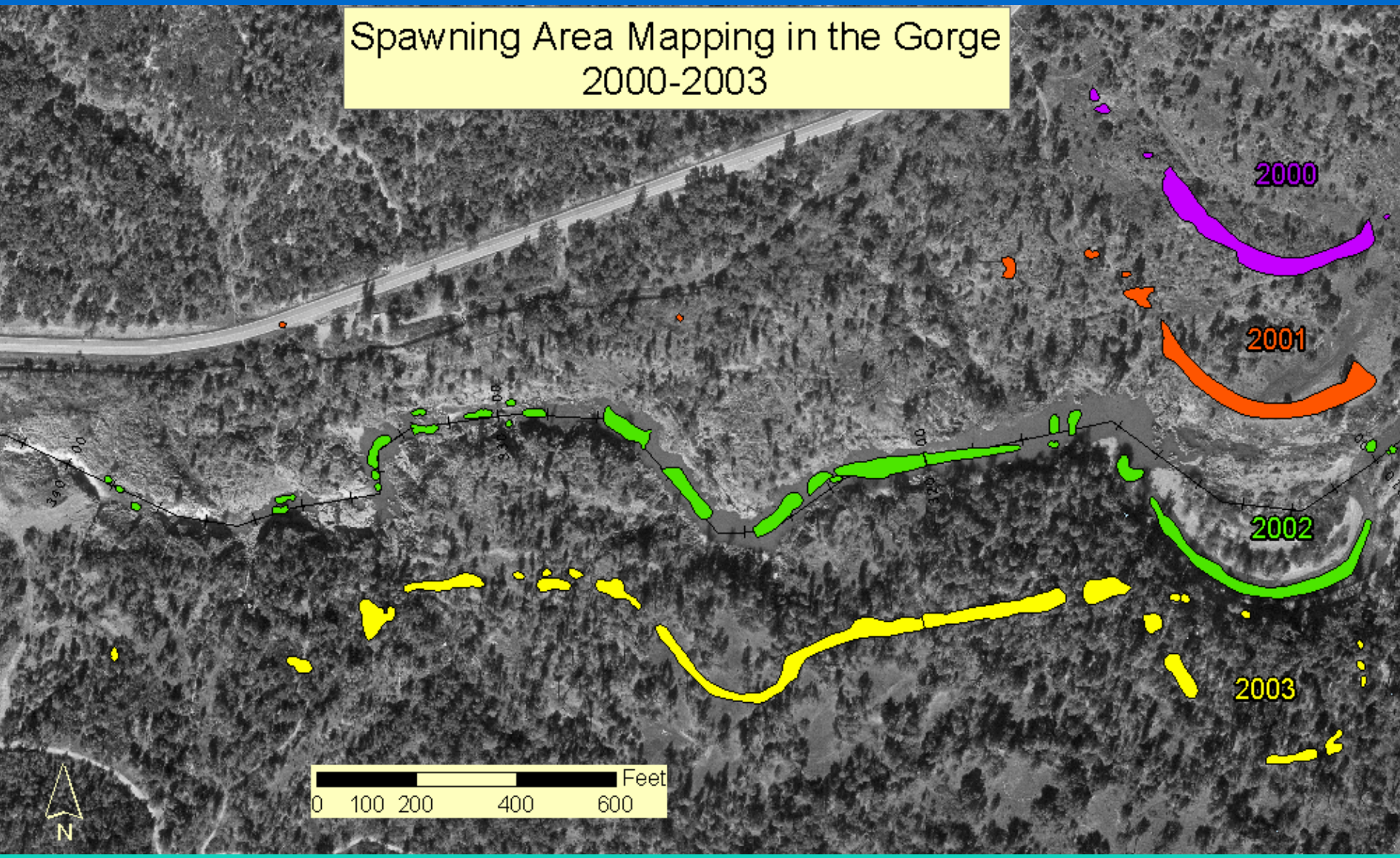
- Carcass surveys-
  - redd counts, spawning area mapping
- Snorkel and kayak based surveys-
  - map gravel and measure redds
- Long-term gravel monitoring sites-
  - bulk samples, pebble counts, permeability along with cross sections and long surveys
- Stranding surveys

Creation of New Spawning Area Below the Gorge

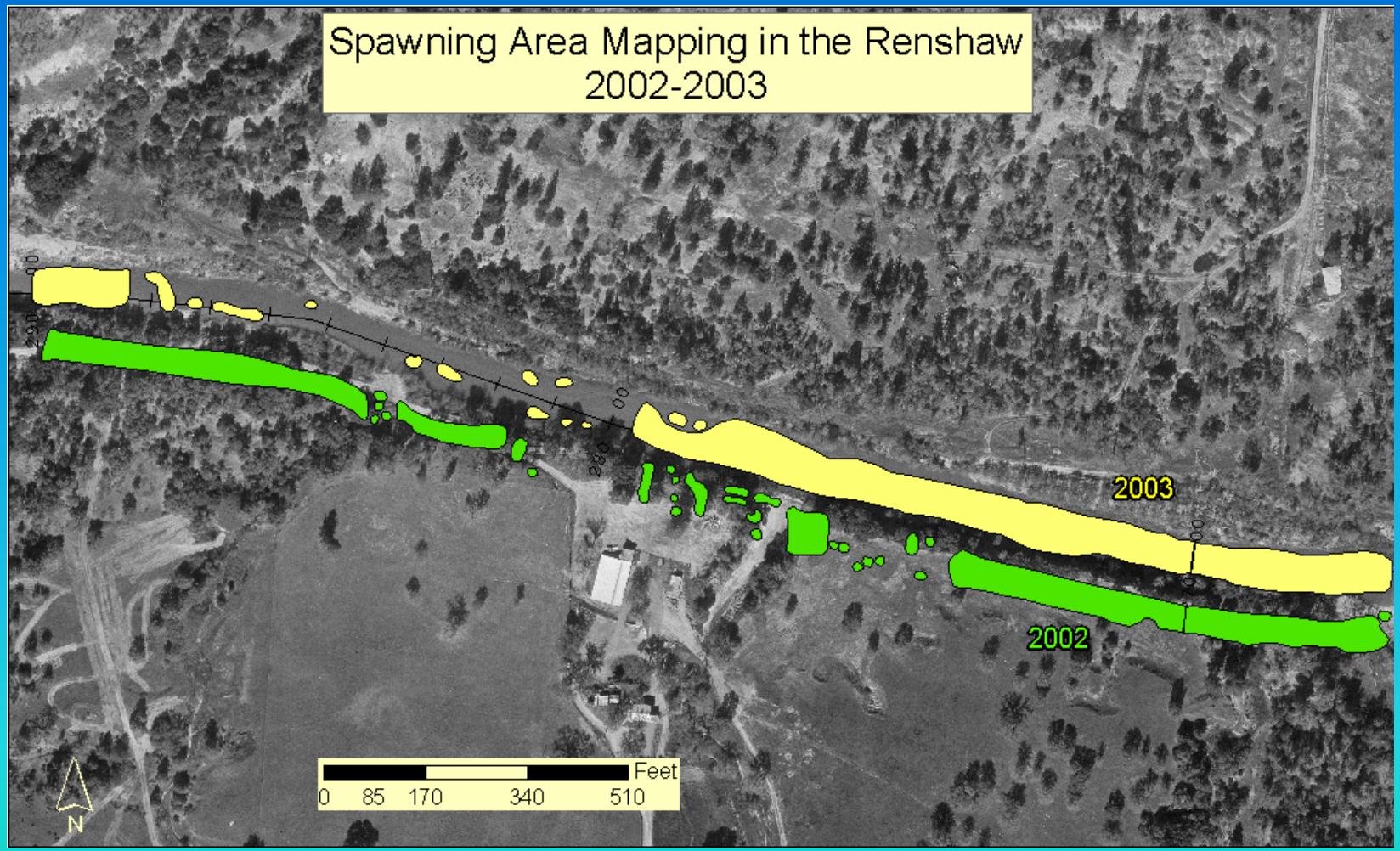


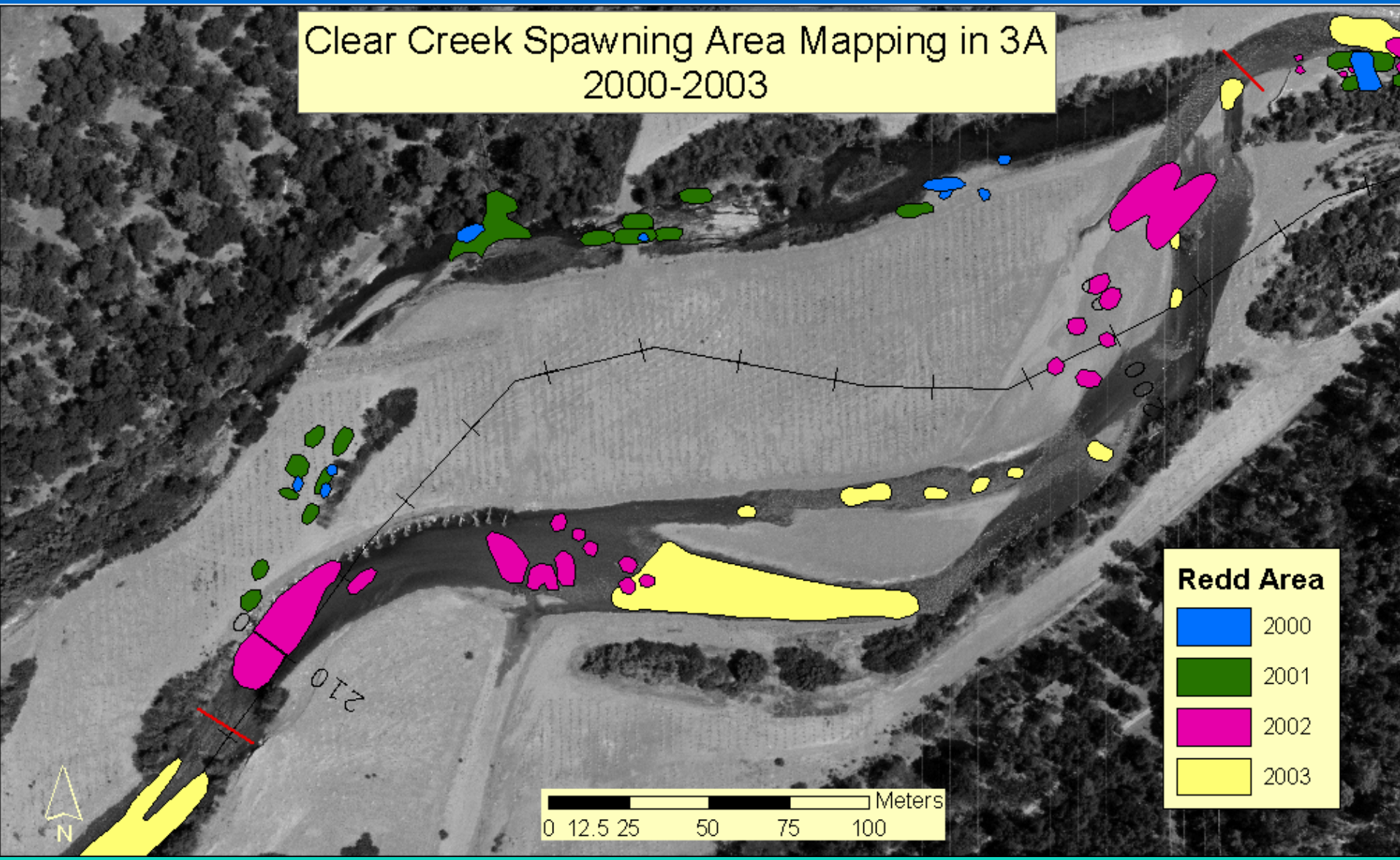
Creation of Spawning Areas IN the Gorge

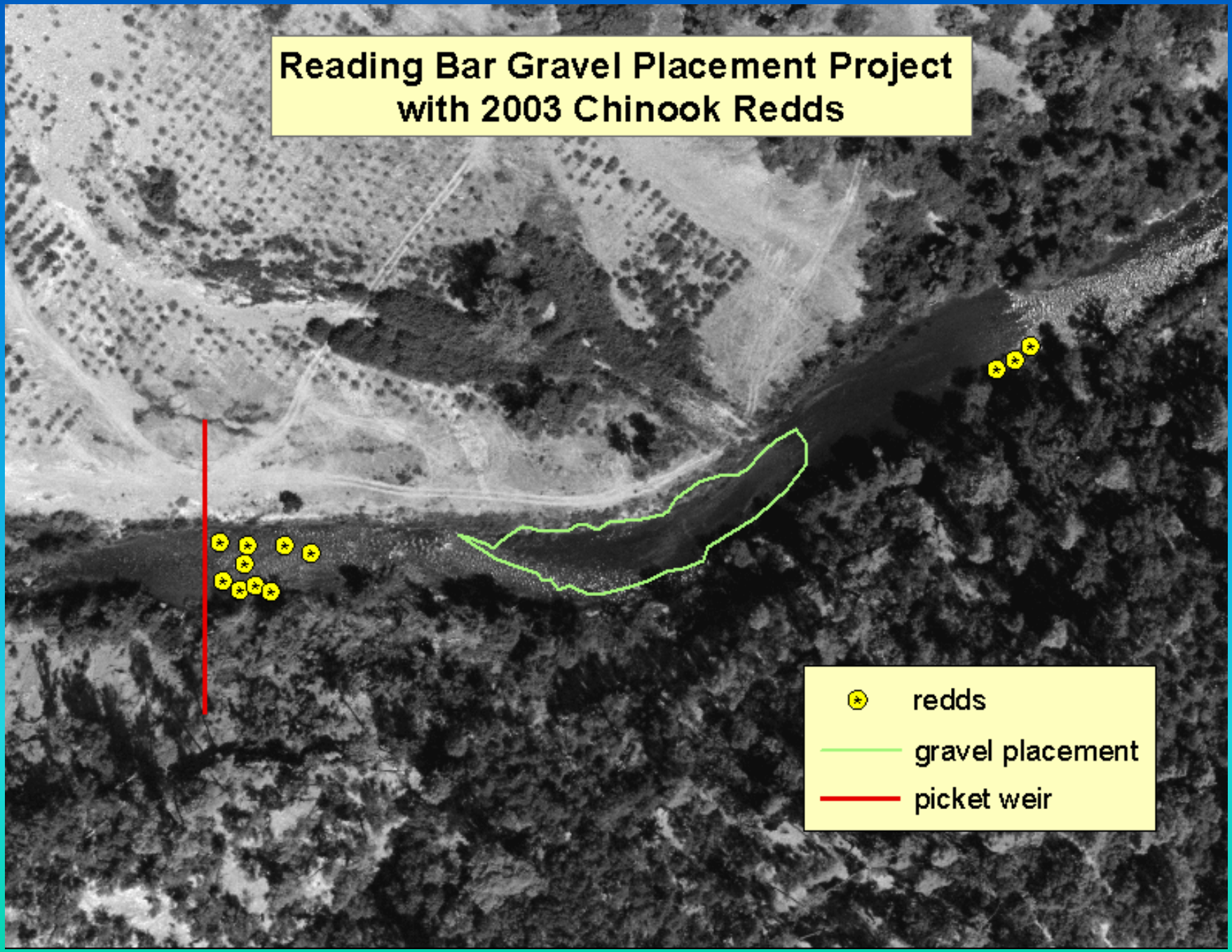


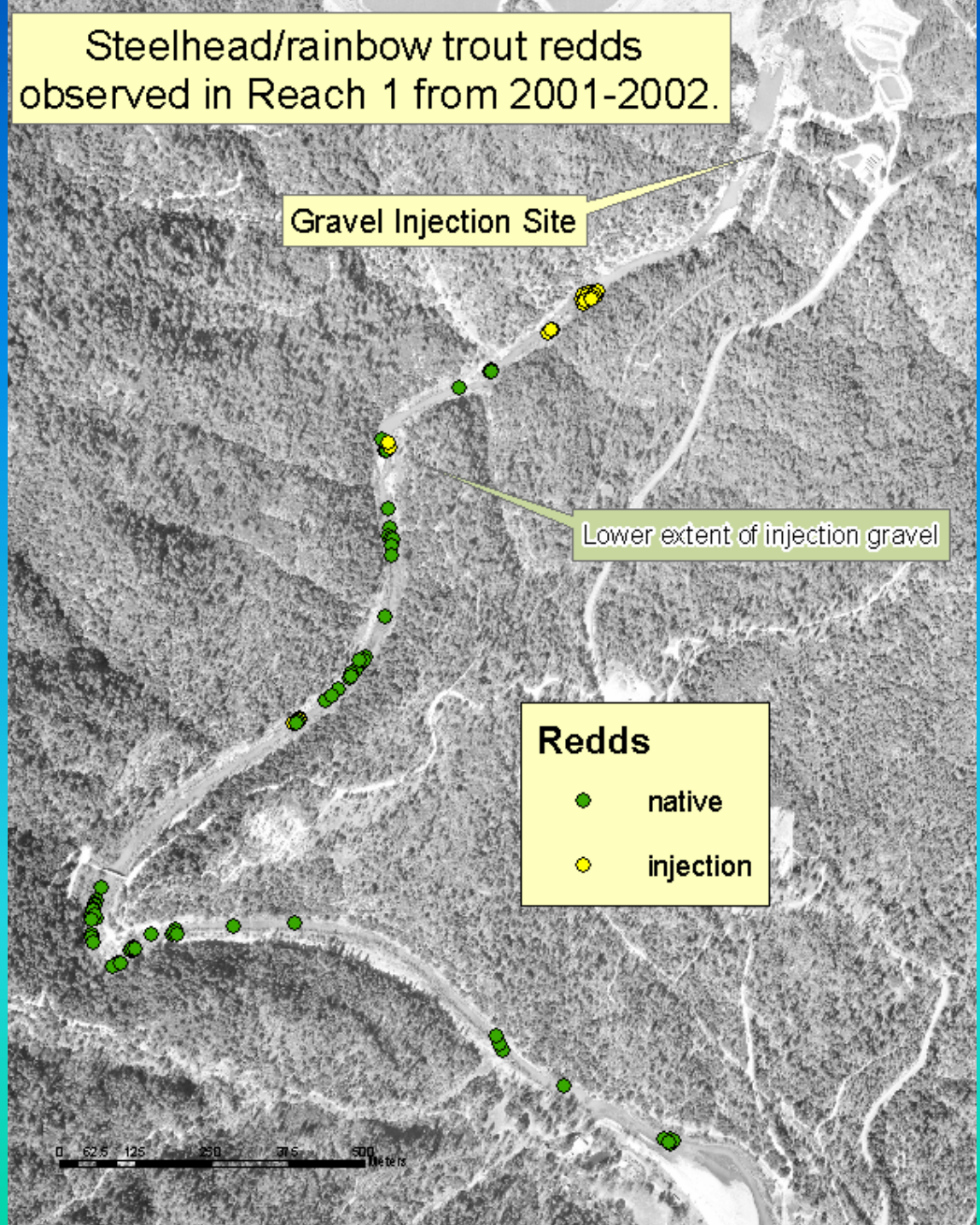

Spawning Area Mapping in the Gorge
2000-2003
2000
2001
2002
2003
Feet
0 100 200 400 600
N


Gorge 1997
Gorge 2003

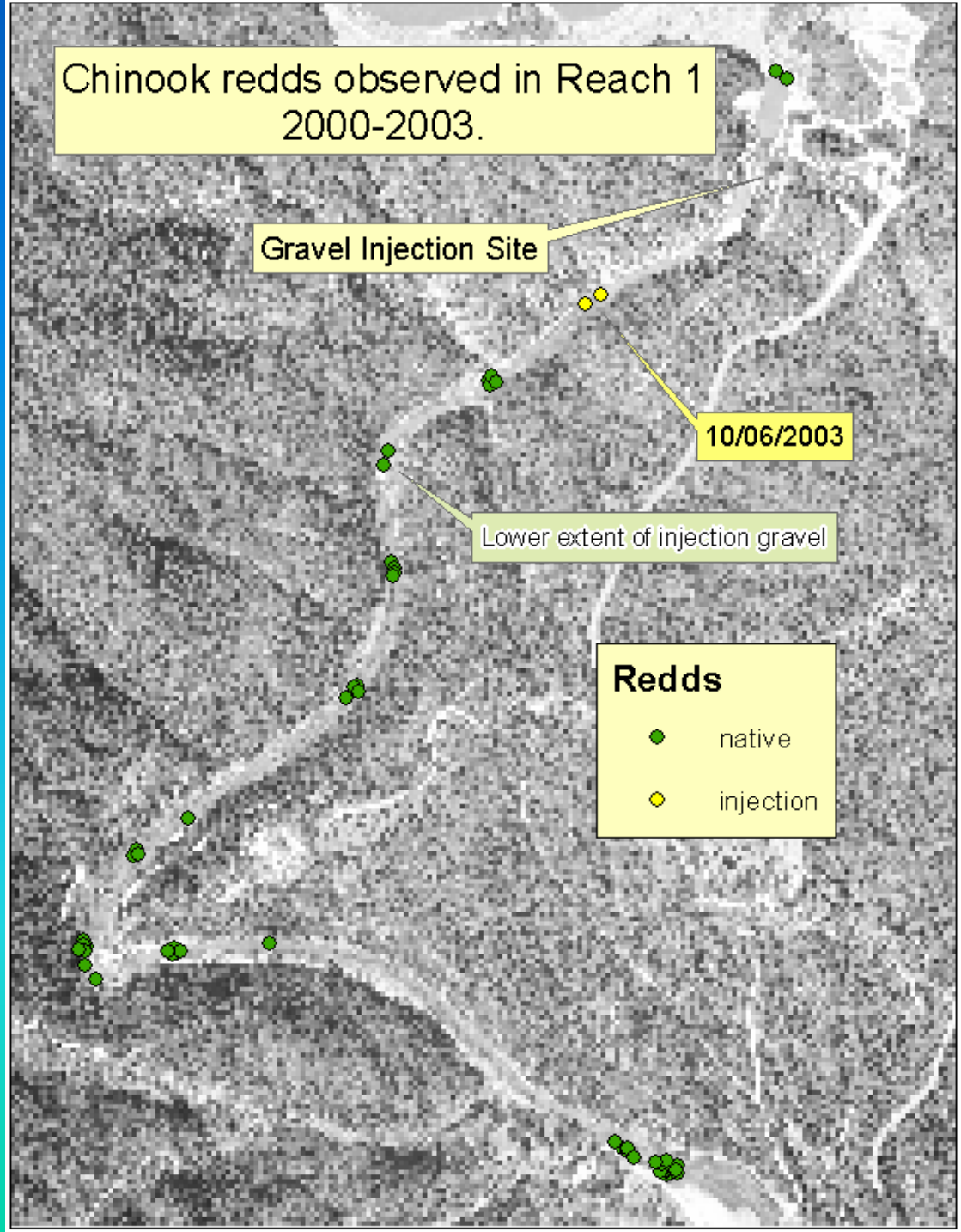

Spawning Area Mapping in the Renshaw
2002-2003
2003
2002
Feet
0 85 170 340 510
N


Clear Creek Spawning Area Mapping in 3A
2000-2003
Redd Area
2000
2001
2002
2003
Meters
0 12.5 25 50 75 100
N

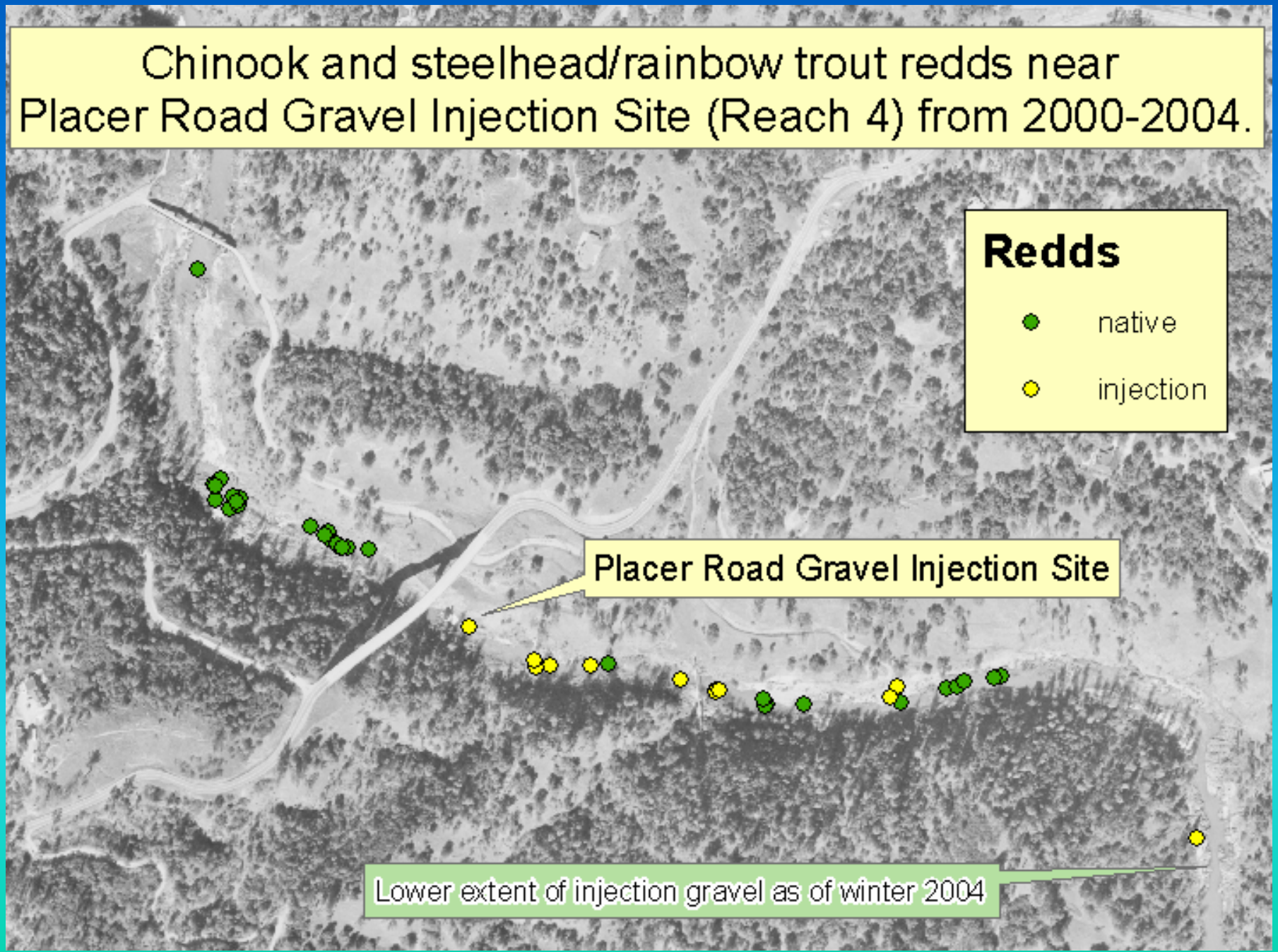

Reading Bar Gravel Placement Project
with 2003 Chinook Redds
redds
gravel placement
picket weir



32% of 230 redds


Chinook redds observed in Reach 1
2000-2003.
Gravel Injection Site
10/06/2003
Lower extent of injection gravel
Redds
native
injection

4% of
57 redds



9% CHN and 22% STT

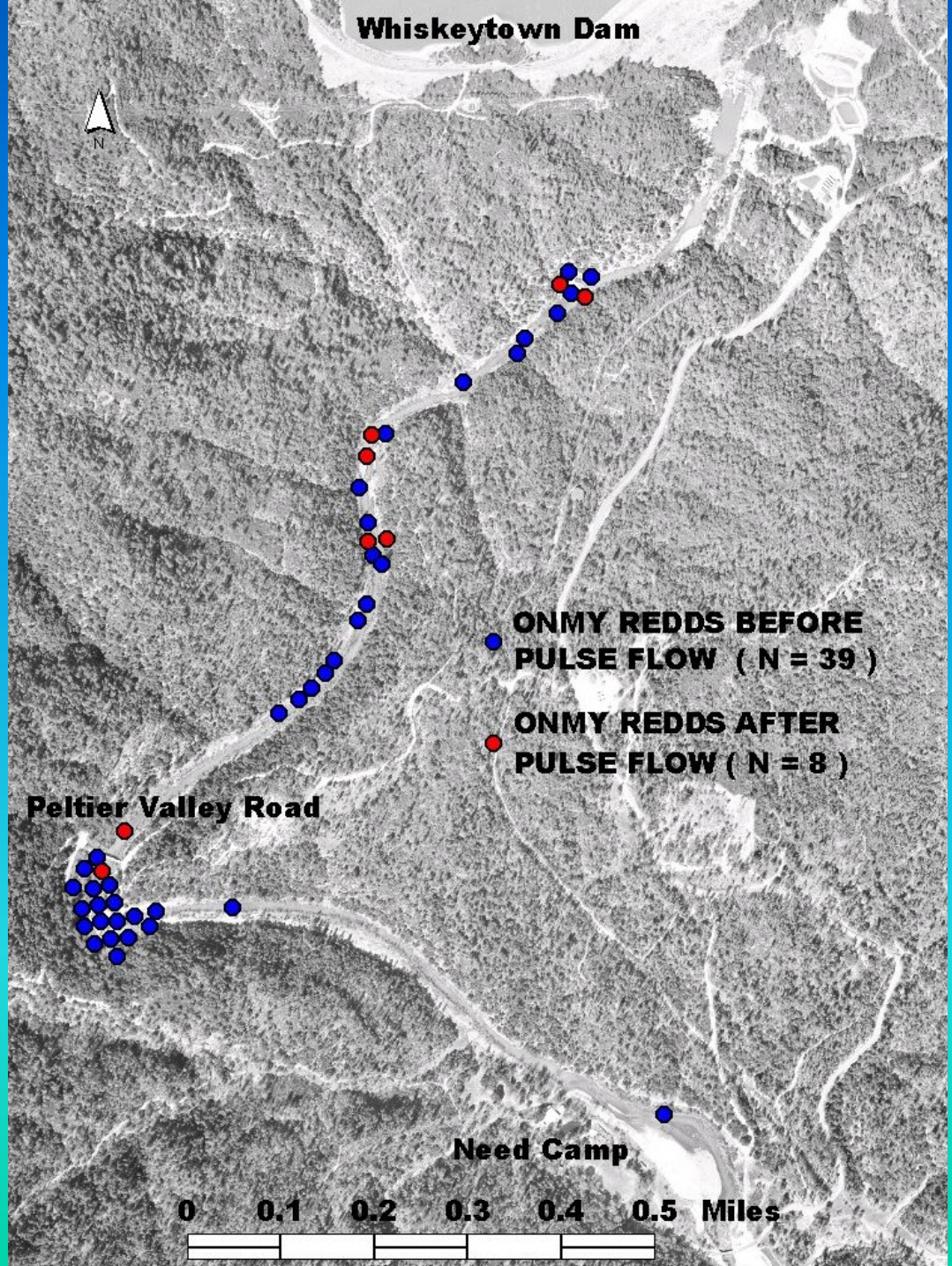

Gravel Distribution Pulse Flow

Large Managed Releases a.k.a Flushing flows

- “Flushing Flows: a review of concepts relevant to Clear Creek”
- Increasing Whiskeytown Dam outflow- value engineering study
- Bedload Transport Monitoring
- ESSA decision analysis model
- Experimental gravel distribution flows
- EWP Proposal for Clear Creek

Before

After


Whiskeytown Dam
N
ONMY REDDS BEFORE
PULSE FLOW (N = 39)
ONMY REDDS AFTER
PULSE FLOW (N = 8)
Peltier Valley Road
Need Camp
0 0.1 0.2 0.3 0.4 0.5 Miles

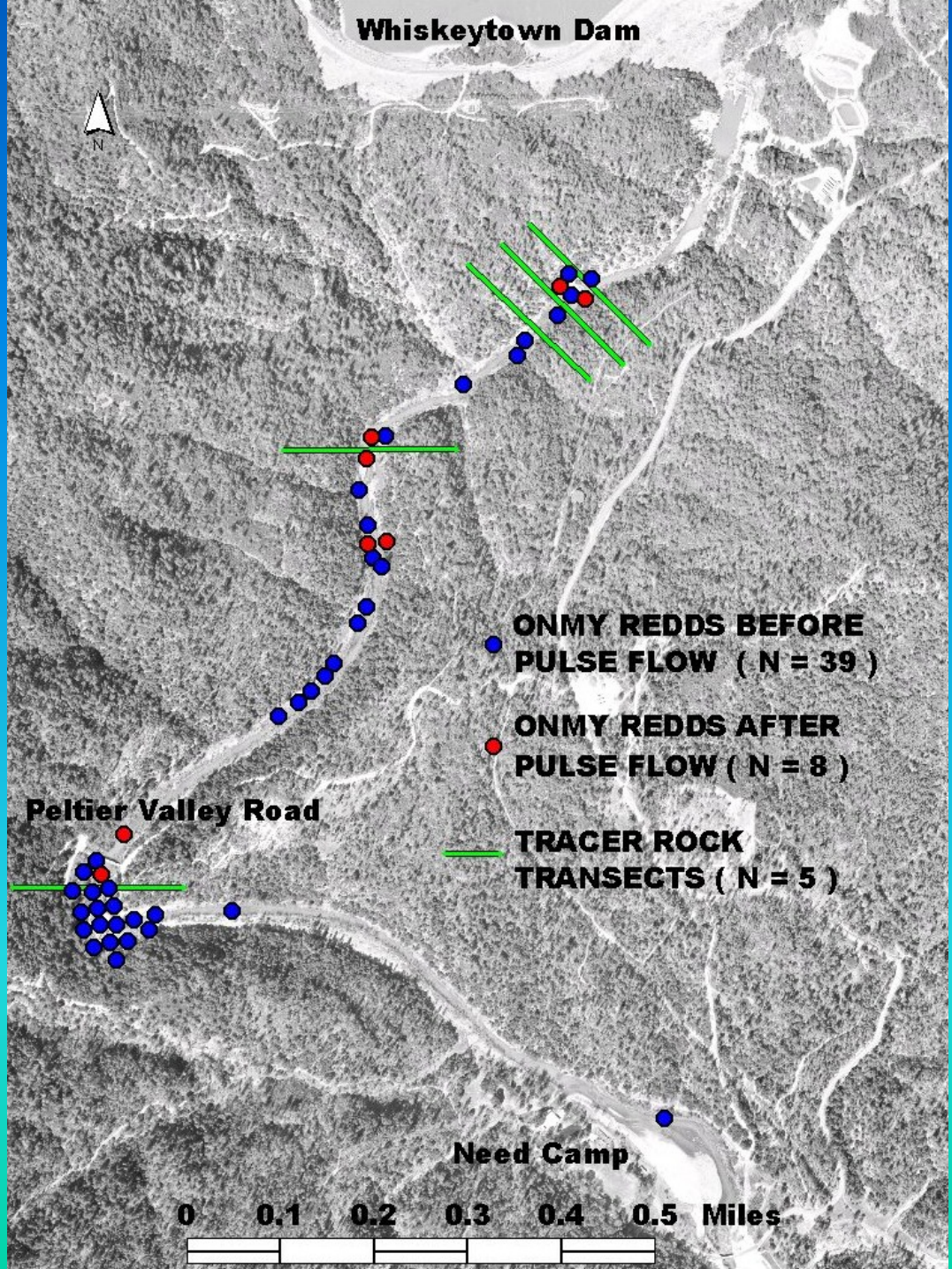
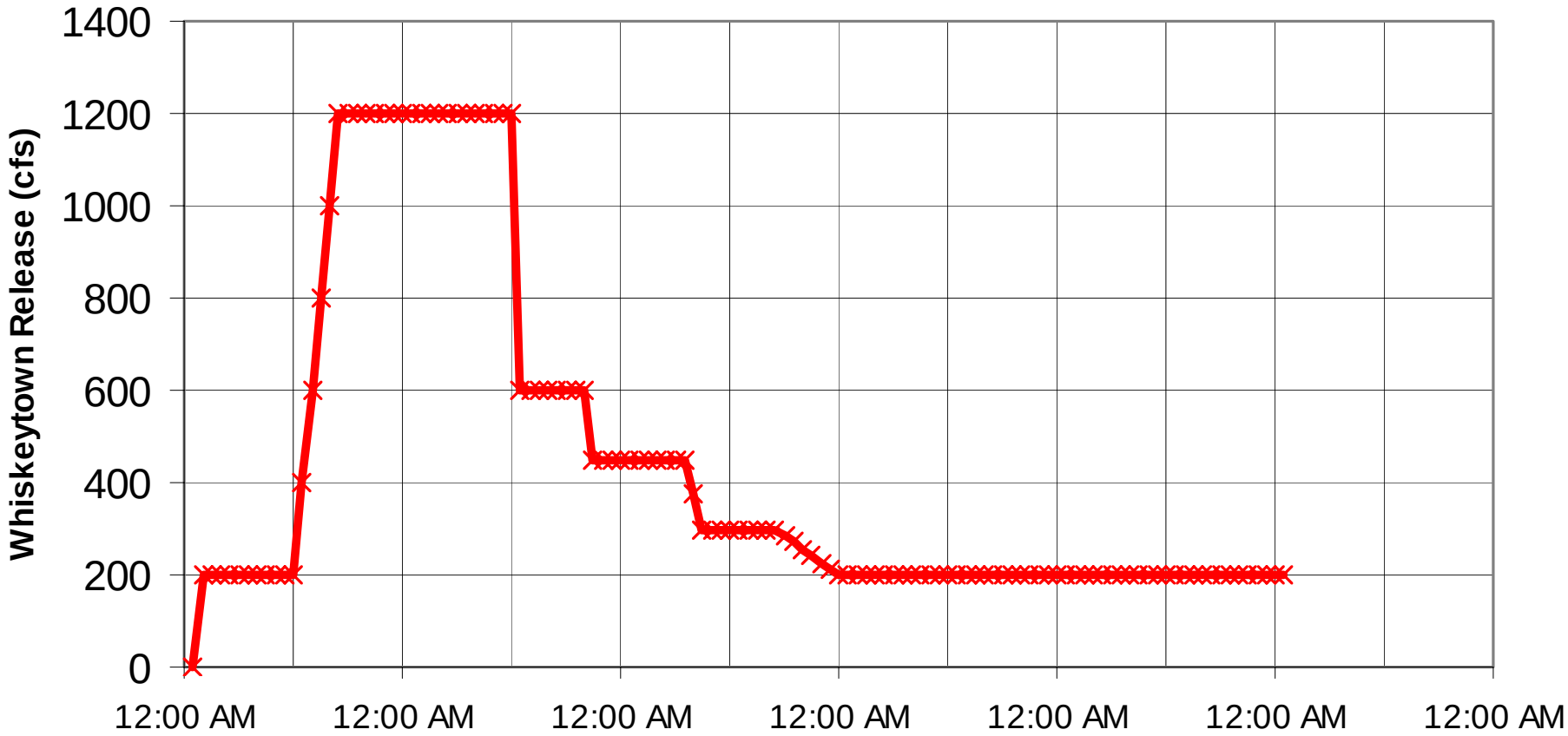
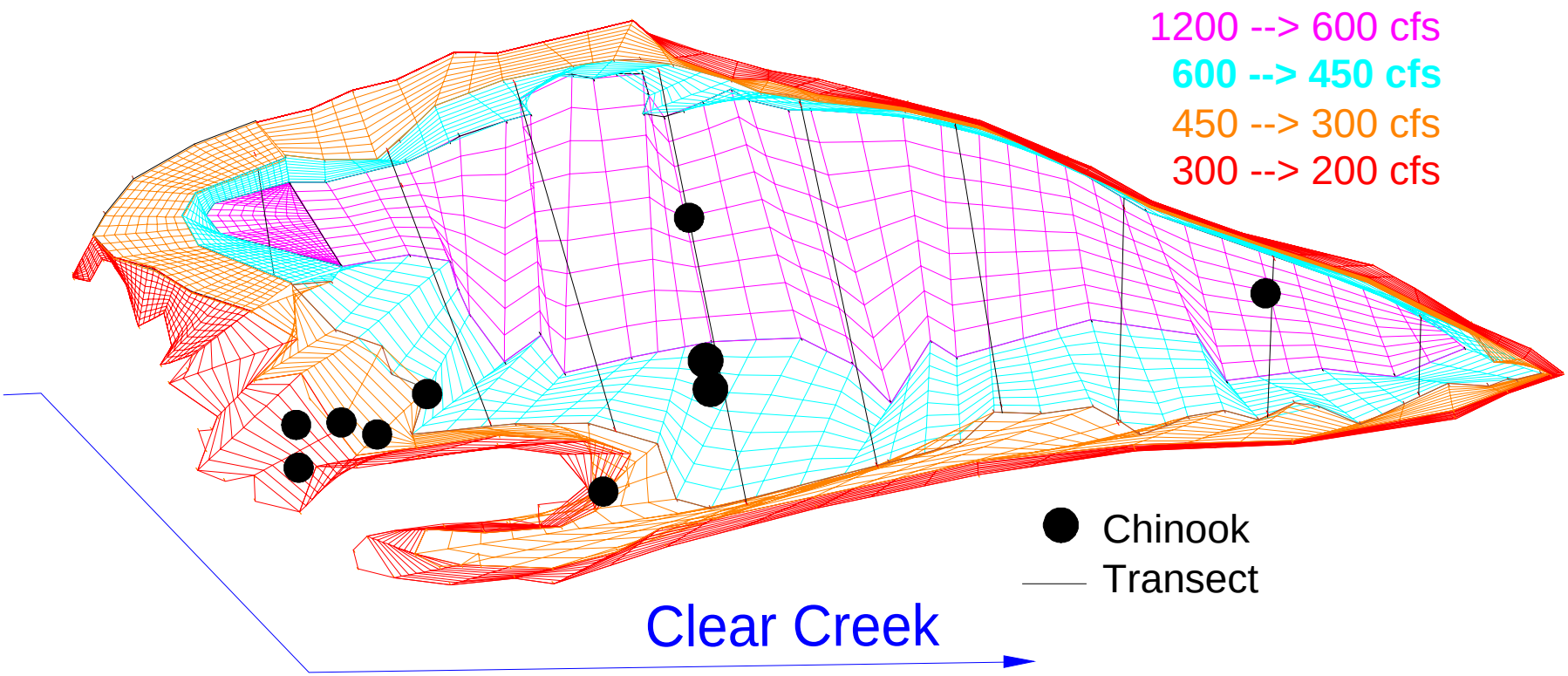

Whiskeytown Dam
N
ONMY REDDS BEFORE PULSE FLOW (N = 39)
ONMY REDDS AFTER PULSE FLOW (N = 8)
TRACER ROCK TRANSECTS (N = 5)
Peltier Valley Road
Need Camp
0 0.1 0.2 0.3 0.4 0.5 Miles

Figure 1. Clear Creek Pulse Flow of 2,422 Additional Acre Feet



Rotary Screw Trap Bar

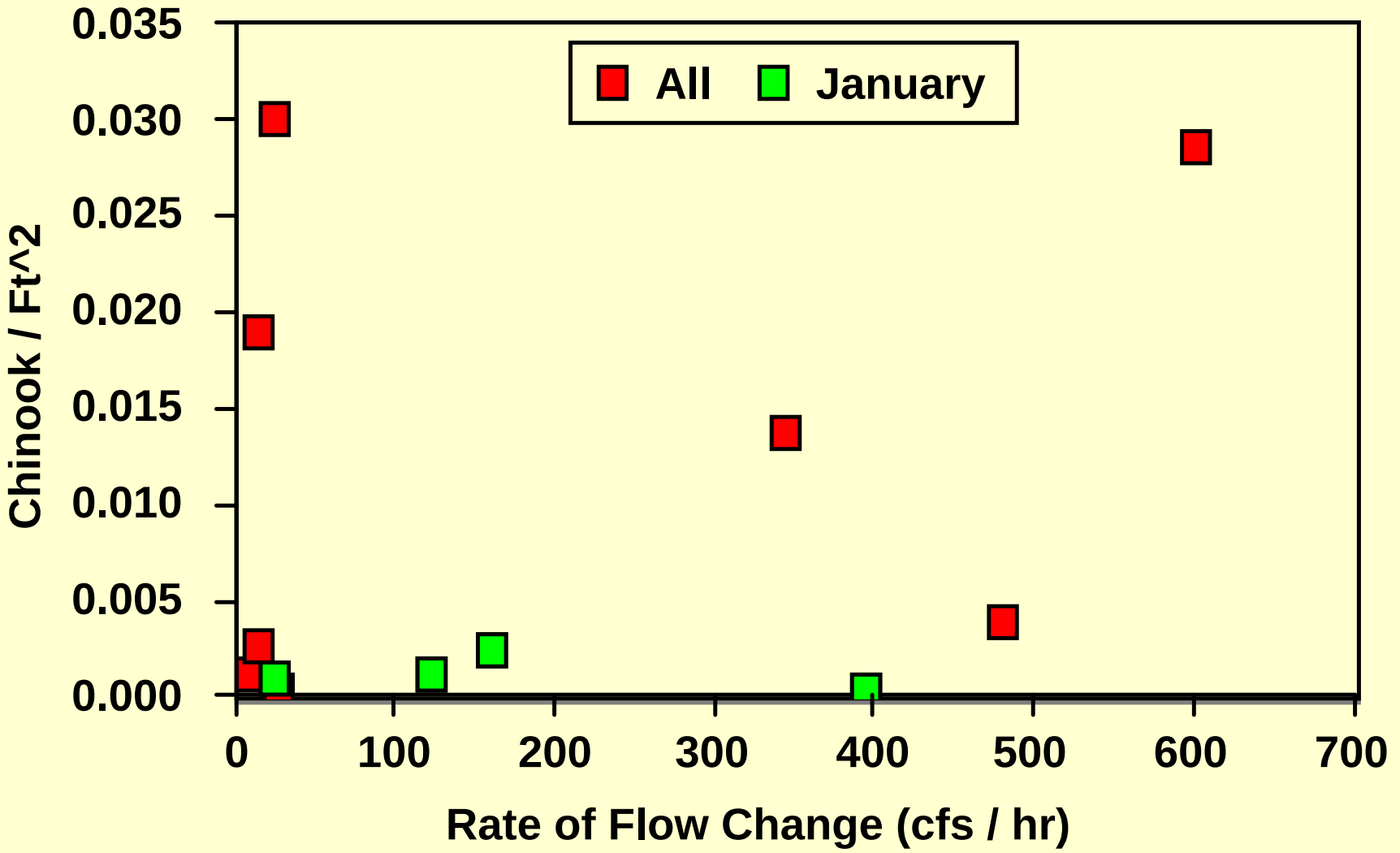
Clear Creek Pulse Flow Stranding Study



Results: 20 Chinook stranded in 40,903 ft2 (0.9 football fields)

Estimate: 91 Chinook stranded in 259,722 ft^2 (5.4 football fields)

Stranding Results



The End

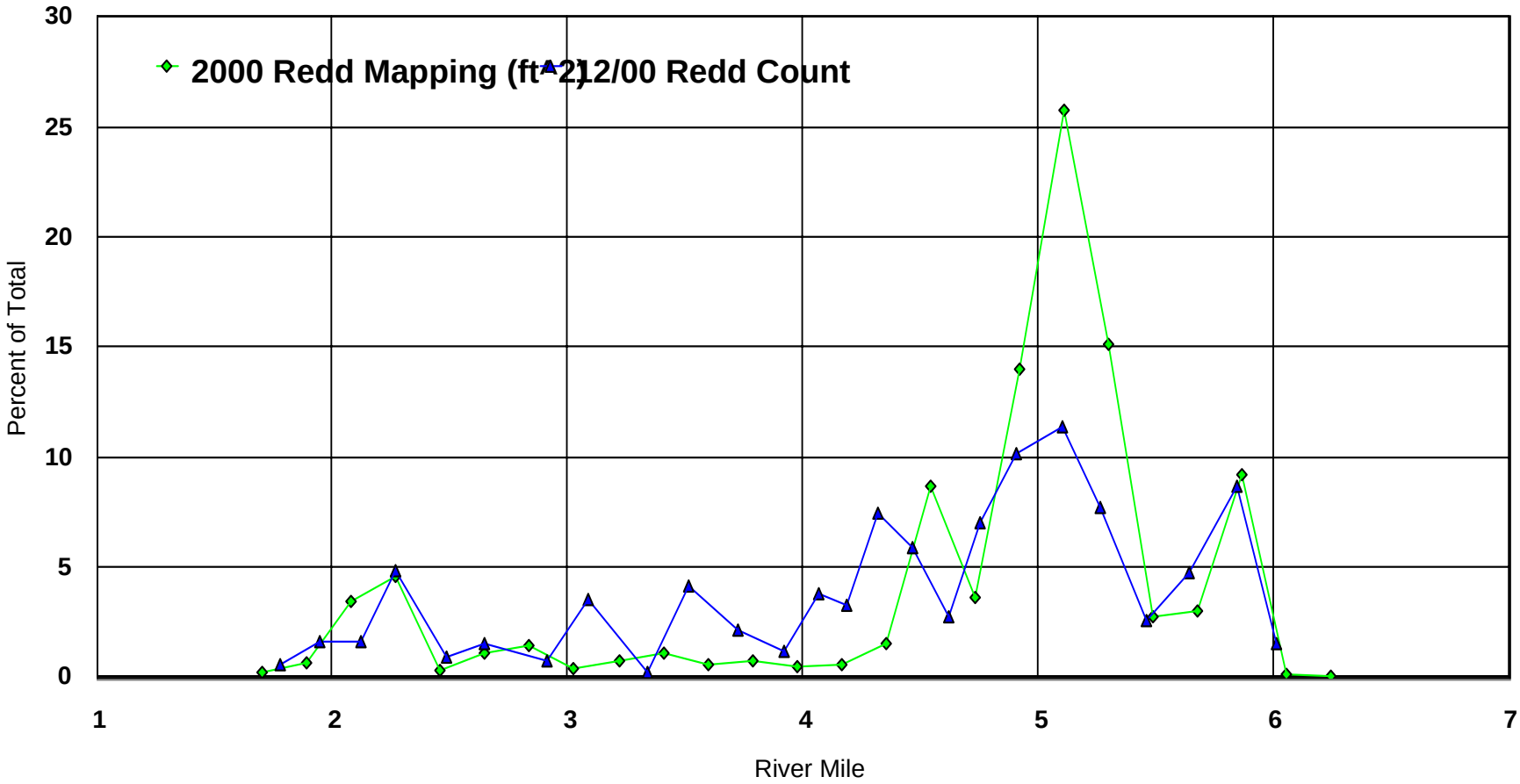
Regulatory concerns and other uncertainties

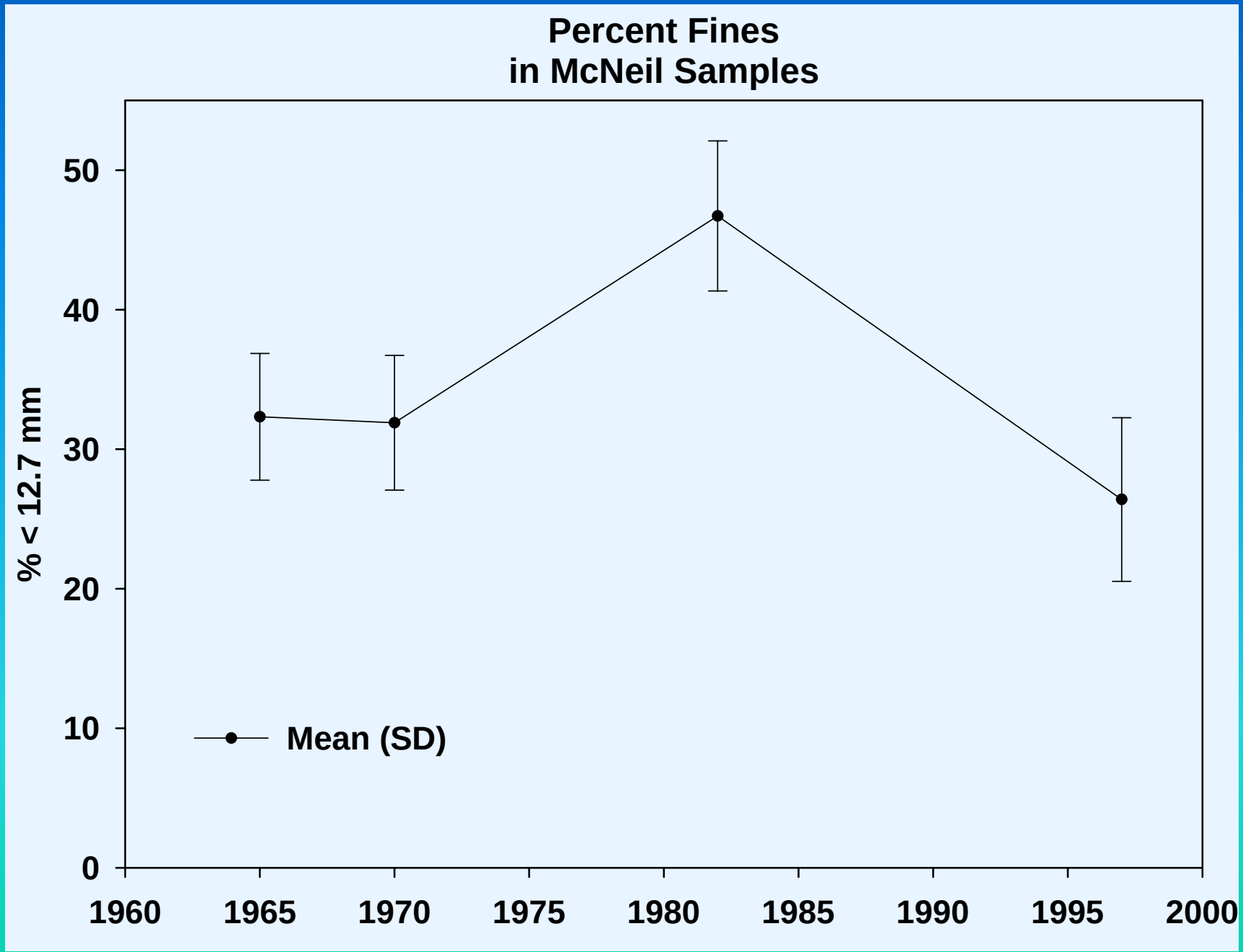
- Turbidity
- Fines
- Mercury
- Cost of gravel
- Wild and Scenic designation
- Riparian impacts
- Access

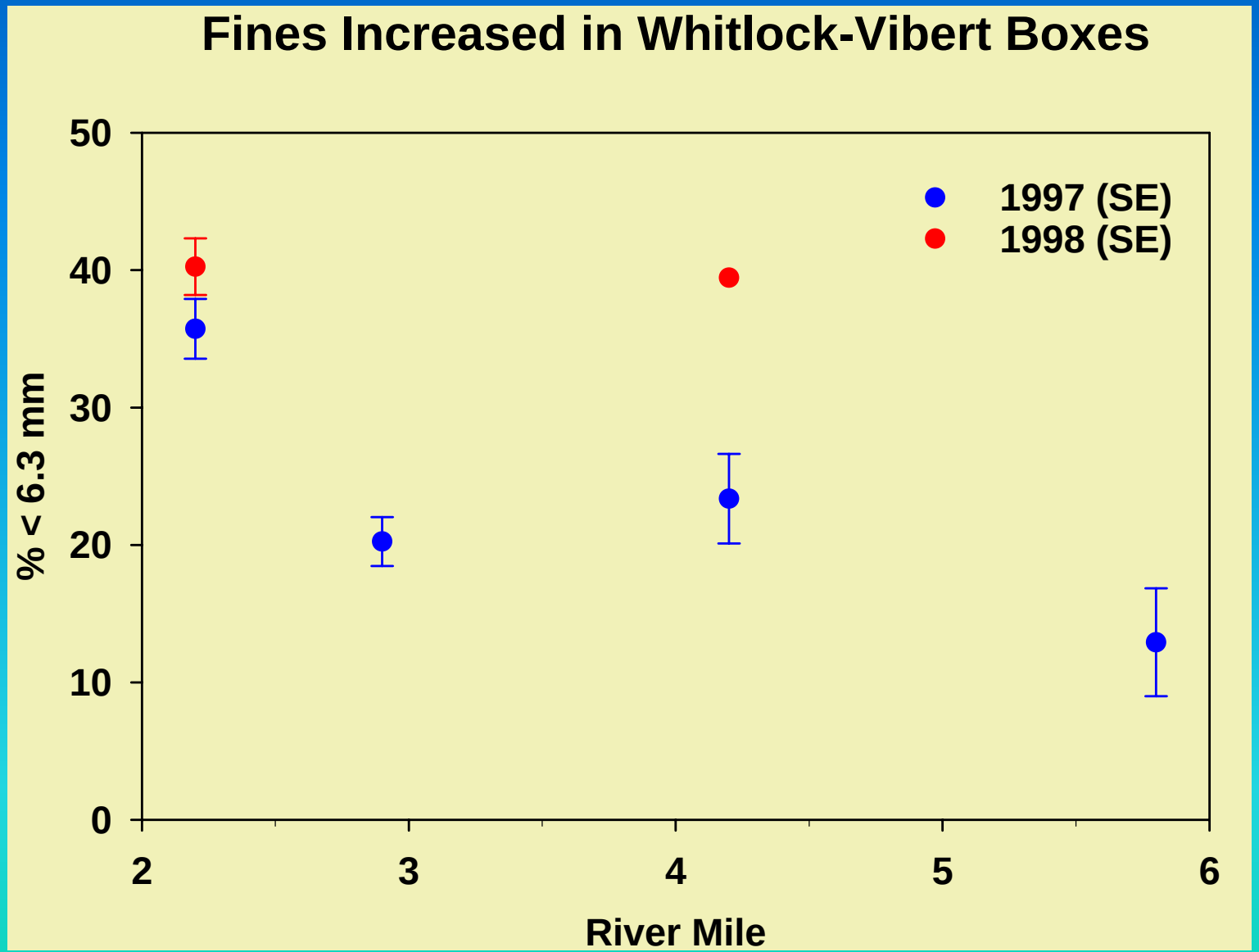
Good questions

- Is “steelhead” gravel too small for Chinook
- Does gravel need to season? Get dirty? Go native? Smell good

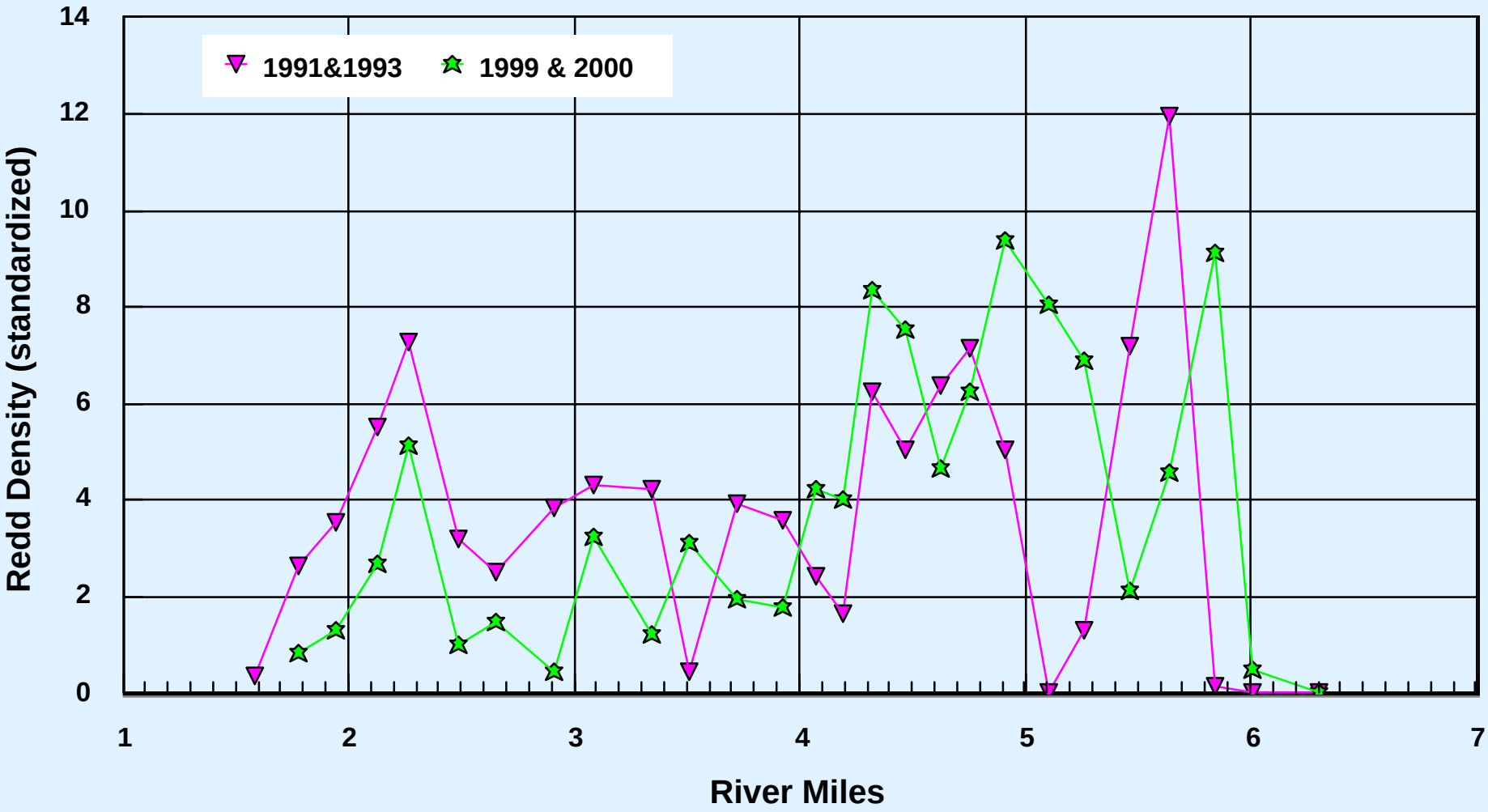
Redd mapping vs Redd count




Percent Fines
in McNeil Samples
% < 12.7 mm
50
40
30
20
10
0
1960
1965
1970
1975
1980
1985
1990
1995
2000
Mean (SD)


Fines Increased in Whitlock-Vibert Boxes
50
40
30
20
10
0
% < 6.3 mm
2
3
4
5
6
River Mile
1997 (SE)
1998 (SE)

Creation of New Spawning Area Below the Gorge



Five temporal phases

- Injections Below Saeltzer Dam- 1996
- Injections Below Whiskeytown Dam- 1998
- Saeltzer Dam removal- 2000
- Placement projects- 2002
- Pulse flow to distribute gravel- 2003